the vertical dimension of the implanted region **104** is automatically determined by the implant energy and dose used in the formation of the buried field shaping region **104**.

In the formation of the buried field shaping region **104**, the precise x and y locations, the width Δx, and charge Q, can be determined for each particular semiconductor device with which the structure and method are associated. Typically, for example, the effect of a particular buried field shaping region can be simulated using available simulation tools to determine an approximation of the resulting radius of curvature or depletion configuration resulting from the presence of the buried field shaping region. Thereafter, for more precise determination, experimentation may be performed to achieve a precise depletion region configuration.

It can be seen that the resulting structure by virtue of the use of the varied field shaping region **104** is smaller than those that result from the breakdown voltage increasing techniques described with respect to FIGS. **1–4**, and, also, provides a nearly equal on-resistance or voltage drop for the same breakdown voltage. Moreover, it should be noted that as the voltage is increased the radius of curvature of the depletion region **106** that results as the depletion region passes the buried field shaping region **104** is larger than would have resulted if the buried field shaping region **104** were not present; that is, from that inherently produced at the junction between the device region **96** and the epitaxial layer **92**.

In the construction or formation of the buried field shaping region **106**, a mask (not shown) having an opening through which the forming implant is performed is provided on the surface of the epitaxial layer **92**. The mask opening will affect the ultimate size or width, Δx, of the final resulting buried field shaping region **104**. As known, there is a relationship between the scattering effects of the implant through a mask opening with the depth of the implant, which is a function of the energy at which the implant is performed.

The structure and method of the invention can be used in conjunction with other existing techniques for increasing the breakdown voltage of transistors and other semiconductor devices. For example, with reference additionally to FIGS. **6***a* and **6***b*, the buried field shaping region **104** can be used in conjunction with, for example, surface rings, such as the ring **115** shown, to provide a modified semiconductor device **90'**.

The considerations for the location of the buried field shaping region **104** are centrally the same as those described above with reference to the location of the region **104** with respect to the device region **96**, except that the location is specified instead with respect to the extent of the surface field shaping ring **115**. Thus, as shown, the depletion region **106** with a small voltage applied extends between the surface field shaping ring **115** and the buried field shaping region **104**. As the voltage is increased, the depletion region **106** assumes a configuration as shown if FIG. **6***b*, having a relatively large radius of curvature **110'**, which is significantly larger than that which would otherwise occur if the buried field shaping region **104** were not present. Other combinations of the method and structure of the invention with existing field shaping structures will be apparent to those skilled in the art.

Although the invention has been described and illustrated with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example, and that numerous changes in the combination and arrangement of parts can be resorted to by those skilled in the art without departing from the spirit and scope of the invention, as hereinafter claimed.

I claim:

1. A semiconductor device, comprising:

a substrate of first conductivity type;

a device region in said substrate of second conductivity type;

a region of second conductivity type in said substrate completely buried in said substrate at a depth below and separated from said device region, said region of second conductivity type being a ring encircling at least a portion of said semiconductor device, said region of second conductivity type having a center located vertically beneath an outermost doped region of second conductivity type of said semiconductor device.

2. The semiconductor device of claim **1** wherein said region of second conductivity type is located at a distance away from said device region sufficient to permit a depletion region to form between said region of second conductivity type and said device region, when a first voltage is applied between said device region and said substrate.

3. The semiconductor device of claim **2** wherein said distance that said region of second conductivity type is located away from said device region is sufficient to produce a radius of curvature of the depletion region, when a second voltage that is larger than said first voltage is applied between said device region and said substrate, that is larger than a radius of curvature of the depletion region about the device region that would be formed if said region of second conductivity type were not present.

4. The semiconductor device of claim **1** wherein said semiconductor device is a portion of an integrated circuit.

5. The semiconductor device of claim **1** wherein said semiconductor device is a discrete device.

6. The semiconductor device of claim **1** further comprising a field shaping region spaced from said device region at a surface of said substrate and spaced from said region of second conductivity type.

7. The semiconductor device of claim **6** wherein said region of second conductivity type is located at a distance away from said field shaping region sufficient to permit a depletion region to form between said region of second conductivity type and said field shaping region, when a first voltage is applied between said device region and said substrate.

8. The semiconductor device of claim **7** wherein said distance that said region of second conductivity type is located away from said field shaping region is sufficient to produce a radius of curvature of the depletion region, when a second voltage that is larger than said first voltage is applied between said device region and said substrate, that is larger than a radius of curvature of the depletion region about the field shaping region that would be formed if said region of second conductivity type were not present.

9. A semiconductor device structure for increasing a breakdown voltage of a junction between a substrate of first conductivity type and a device region, comprising:

a region of second conductivity type in said substrate completely buried in said substrate below and separated from said device region, said region of second conductivity type being a ring surrounding at least a portion of said device region, said region of second conductivity having a center located vertically beneath an outermost doped region of second conductivity type of said semiconductor device structure.

10. The semiconductor device structure of claim **9** wherein said region of second conductivity type is located at a distance away from said device region sufficient to permit a depletion region to form between said region of second